THE COMMERCIAL PRODUCTS OF INDIA.

The Commercial Products of India, being an abridgment of "The Dictionary of the Economic Products of India." By Sir George Watt. Published under the authority of H.M. Secretary of State for India in Council. Pp. viii+1189. (London: John Murray, 1908.) Price 16*s*. net.

IT is now almost a quarter of a century since the publication of Dr. (now Sir George) Watt's "Dictionary of the Economic Products of India" was commenced. That monumental work is now out of print, and the necessity for the issue of a new and revised edition has been evident for some time. The reissue of the complete Dictionary, however, is likely to be postponed for a good few years, so all the more do we welcome meanwhile the appearance of the present work, and we congratulate Sir George Watt on the completion of his three years' task.

As its subtitle indicates, the book is practically an abridgment of the Dictionary, published under the authority of His Majesty's Secretary of State for India in Council, and written mainly by Sir George Watt under the direction of a supervisory committee appointed by the Secretary of State. The scope of the work was to be "confined to products which are of present or prospective industrial or economic importance," and, on the whole, it has kept fairly well to those limits. The Dictionary consists of six volumes with a total of more than five thousand pages, while the present abridgment is in one volume of a little more than a thousand pages, well printed, and well got up. There is, of course, room for difference of opinion as to the importance or otherwise of some of the products discussed in the abridgment, but, in the main, excellent discrimination has been shown in their selection, for which, however, we understand the author is not responsible.

The articles themselves are modelled on the familiar lines of the Dictionary, and offer evidence of great industry in the consultation and quotation of all possible references, although with regard to the latter a stricter system of selection would have reduced the bulk without detracting from the value of the book. Uniformity of treatment of the heterogeneous items constituting a work of this kind is not, of course, feasible even if it were desirable, but this cannot be held entirely to excuse the uneven quality of the abridgment. Some of the articles give fairly succinct, business-like accounts of their respective subjects, as, for instance (amongst the longer articles), those on india-rubber or flax, and (amongst the shorter ones) those on *Calotropis gigantea, Dioscorea,* or *Pterocarpus*. Others, again, are unnecessarily spun out by failure to discriminate between essential and superfluous information and between proved facts and mere opinions not worth recording. The following examples illustrate this defect.

In the article on tea the historical part is padded with statements such as:—

"We read that Wang Meng, father-in-law of the Emperor in the middle of the fourth century was fond of drinking tea, and set it before his friends, but they found it too bitter, and generally declined, feigning indisposition."

Under *Acorus Calamus,* which, by the way, is scarcely an important product, we are informed that "Dr. Childe, second physician to the Sir Jamsetji Jijibhai Hospital, Bombay, tried an authentic tincture for malaria, dyspepsia, dysentery, and chronic bronchitis, and after careful experiment pronounced it inert." Again, in the article on Rhea, prominence is given to the fascinating effect on the author of the undying faith of a very old lady in the ultimate success of that distinctly doubtful crop.

We admit the difficulty of abridging a description in which one has also to incorporate the most recently acquired knowledge, but this difficulty should not necessitate the actual expansion of a dictionary article. Yet several of the articles in the abridgment are actually longer than the corresponding ones in the Dictionary. Thus in the Dictionary fifteen pages are devoted to *Boehmeria nivea,* and fourteen to *Camellia theifera,* while in the abridgment the number of pages are respectively sixteen and thirty-five.

We mention these defects from the point of view of one who hopes to have frequent occasion to consult the work, but dislikes the trouble of sifting the gold from the dross. Despite those blemishes, however, which we trust a more rigorous application of the blue pencil will cause to disappear in the next edition, there can be no question of the great value of Sir George Watt's book. He has laid a fresh debt of gratitude on all interested in India or its products by performing a work that very few but himself would have had the interest, industry, and patience necessary to accomplish. A. T. GAGE.

THE PHYSICS OF EARTHQUAKES.

The Physics of Earthquake Phenomena. By Dr. C. G. Knott. Pp. xii+283. (Oxford: Clarendon Press, 1908.) Price 14*s*. net.

EARTHQUAKES, once regarded as portents and warnings to mankind, have become an object of human curiosity, and now form a branch of knowledge of which the principal external relations are threefold. They are of interest to the physicist, and their interpretation demands the application of the knowledge he has won; they interest the geologist as an explanation of, and as explained by, his observations of the structure of the earth; and they interest the man of commerce or affairs by their effect on man and on commerce and industry. With these varied outlooks it seems almost impossible that any one man should write a satisfactory handbook of seismology, and recent attempts leave much to be desired in their incomplete or inaccurate treatment of one or more branches of the science. Dr. Knott has confined himself to the physics of earthquakes, a department of their study with which he is well qualified to deal, and of which, more than of any other, an adequate text-book was required.

To a large extent the book deals with matters contained in other manuals, the treatment differing only

in form and more than usual correctness, and frequently in an unusual point of view. This is particularly noticeable in the chapters devoted to seismographs, which are refreshing in the absence of any polemical advocacy of one pattern of instrument or depreciation of another; there is little in the way of description of particular instruments or types of seismograph, and no attention is devoted to details of mechanical construction, which may vary according to the purpose of the instrument, but instead we have an impartial statement of the principles on which their construction is based and which control their action. The dynamics of the horizontal pendulum, which have been the subject of both mathematical and experimental investigation, are treated in a manner which makes them clear to anyone able to follow the simple mathematics used in the text, but it is unfortunate that Dr. Knott had not more mercy on those less mathematically disposed than himself, and expressed his numerical results in a form more immediately intelligible than that adopted by him.

This question of the behaviour of the horizontal pendulum in response to a periodic undulatory tilting, as opposed to its response to a static tilt, is one which has an important bearing on the design of seismographs; in most of these the design has been to eliminate resistance so far as possible, but there is another school which deliberately introduces a damping device of sufficient power to make the pendulum dead-beat or aperiodic, and it has been claimed that this damping renders the record accurate and capable of interpretation in terms of the displacement produced by a static tilt. Dr. Knott's figures show that this claim is unfounded. Where the period of the undulation is not less than three times that of the free swing of the pendulum, the amplitude of the record is within 10 per cent. of the displacement due to a static tilt of the same angle, the error being in excess in the case of the free and in defect in the case of the damped pendulum. When the period of the undulation approaches nearer to equality with that of the pendulum, the amplitude of the record increases largely in the case of the undamped pendulum and becomes diminished in the case of the damped pendulum, but in neither type is it possible to determine the true value of the angular tilt from the amplitude of the record. From this it will be seen that the result of a complete damping of the pendular swing is a diminution of sensitiveness of the instrument, and as it is only when the period of the undulation reaches three times that of the pendulum that either form gives a record capable of approximate interpretation in terms of the static tilt, there is no material difference in accuracy between the two when this limit is reached.

The periodicity of earthquakes is discussed at some length, with the general result that there is little evidence of the reality of any of the periods believed to have been established. We are not only in complete agreement with this conclusion, but would go even further than Dr. Knott in our distrust of the utility of applying the method of harmonic analysis to the discussion of effects the causes of which do not vary in a harmonic manner, and the method seems particularly inapplicable to the discussion of the effect of tide-producing stresses in the causation of earthquakes. The amount and direction of this stress, at any given instant and place, depend on the zenith distance, not on the hour angle, of the tide-producing body, and though these vary with each other, they do not vary in any uniform proportion. In these circumstances an harmonic analysis of the time of occurrence of earthquakes seems calculated to obscure rather than elucidate any direct effect of the tide-producing force, though it might reveal a tidal effect of a different nature.

For the rest the book is an adequate and clearly expressed treatment of the subject it professes to deal with. It cannot be described as easy reading, yet the difficulty lies entirely in the accuracy of its expression, and the consequent necessity for the frequent use of words unfamiliar except to the trained physicist, but anyone who is desirous of understanding, and will take the trouble to master the meaning of these unfamiliar terms, will find no difficulty in following the argument.

METHODS OF ACCURATE CALORIMETRY.

Méthodes de Calorimétrie usitées au Laboratoire thermique de l'Université de Moscou. By Profs. W. Louguinine and A. Schukarew. Translated from the Russian by G. T. Gazarian. Pp. iii+192. (Paris: A. Hermann; Genève: Georg et Cie., 1908.) Price 8 francs.

THIS volume by the well-known director of the thermal laboratory at Moscow University and his chief of staff does not claim to be a comprehensive treatise on all branches of calorimetric work, but, nevertheless, it will be welcomed as placing before a wider public the results of much valuable research hitherto comparatively unknown, especially in detail. Some of Prof. Louguinine's ingenious devices for carrying out accurate calorimetric investigations have been partly described in specialist treatises, but we have here complete descriptions, with full and clear working drawings, published, we believe, for the first time, except in their original Russian.

In calorimetry, perhaps to a greater extent than in most branches of physics, very much of the success attained in a particular experiment depends on attention to what might be considered small details. In our opinion, one of the most valuable features of the book is the large number of "wrinkles" or "tips" given by the writers from their own experience on just those points on which the ordinary books are silent.

The first chapter is an excellent discussion of the various types of thermometers used in calorimetry. The writers point out the absurdity of adhering to the German form of thermometer with milk-glass scale, carrying the graduations behind a thin capillary tube and enclosed in an outer sheath. Even if the milk-glass scale is fastened more or less by fusion at one or the other end of the tube, the type has many drawbacks, and would probably have been replaced long